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eral plan, the scholar is much more apt to acquaint himself with advances outside of his particular field, and thus such an arrangement tends, at least in a slight degree, towards maintaining that community of interest and sympathy which is so helpful in the harmonious development of science. As Darboux pointed out in his recent address before the International Congress of Mathematicians at Rome, there is danger of estrangement even in a single science, and this danger is still more real as regards the various sciences which should be mutually helpful.

In arranging the material of the present volume we are told that it frequently became necessary for a specialist to examine the articles in some detail, as the headings were often too vague to give a definite idea in regard to the results which were reached in the articles. This is especially true of those which appeared between 1884 and 1900, while most of the earlier papers were classified according to their headings. Although great care seems to have been exercised, it is not difficult to find instances where the classifier did not exhibit sufficient knowledge of the subject. For example, it is difficult to see why a note on "Test of a simple group" should be classed under general group theory while such a general article as that of Dyck on "Groups of discrete operations" is classed among the more special articles on discrete groups of finite order. An instance where the classification according to the headings of articles is entirely misleading is furnished by the papers by Cockle which appeared in volumes VI., VII. and VIII. of the *Cambridge and Dublin Mathematical Journal*, under the title of "Method of vanishing groups," although they relate to a species of indeterminate analysis and have nothing in common with what is now regarded as group theory. In the present volume they appear, however, under this general heading.

An instance where the classifier seems to have misunderstood the meaning of a technical mathematical term is furnished by the note on *permutants*, published by Bilenki in *Nouvelles Annales de Mathématiques* (1900). As the heading implies, this note relates to the

theory of matrices, but it is classified with substitutions and permutations in the present volume. It may be of interest to observe that the term *permutants* does not appear in Müller's "Mathematisches Vocabularium," although this valuable work contains more than ten thousand technical terms with their French equivalents.

These instances suffice to make it clear that the scholar can not regard the present index as final authority, either as regards completeness or as regards reliability. On the other hand, extensive historical research among the literature of the historical century will still be richly rewarded. The present volume will, however, be of great assistance in making such research on the part of the mathematician more effective, and it is to be hoped that later editions will be free from many imperfections which could scarcely have been avoided in the first edition of such a very extensive work. The undertaking is a highly laudable one and bespeaks in clear terms a willingness to render an important service, which offers little reward beyond the pleasure in rendering such a service. From this viewpoint the bibliographical activity of the present time exhibits a most inspiring picture of the trend of thought actuating scientific men.

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NOTES ON ENTOMOLOGY

THE Germans have always been considered the authorities on forest entomology, and their text-books the standards. Now a most excellent work has been issued in English by A. T. Gillanders.¹ Mr. Gillanders is manager of the forests of the Duke of Northumberland, and so has had much practical experience. The insects are considered under the order to which they belong; there being tables to families, and often to the genera. After each group there is a short bibliography. Many of the illustrations are photographs of injured parts of the tree, and of the insect upon it. The last chapter contains a list of trees with their injurious insects. Perhaps the weakest

¹"Forest Entomology," pp. 422, figures 351. W. Blackwood and Sons, London, 1908.

part of the volume is the insufficient treatment of larval forms; and the author could have found much information on the life history of many species by consulting the pages of the various English entomological journals.

RECENT numbers of the "Genera Insectorum" include the Brenthidæ (fasc. 65, pp. 88, 2 pls., 1908), a family of curious elongate beetles allied to the true weevils. The author is H. von Schönfeldt. He catalogues 111 genera and 624 species, almost all of which are tropical. This part appears to be well prepared. Professor V. L. Kellogg treats of the Mallophaga (fasc. 66, pp. 87, pls. 3, 1908). Although it treats of the species of the world, it is very much less useful than several of the author's previous publications dealing with American forms of this order. Dr. G. Enderlein has reviewed the neuropterous family Coniopterygidæ (fasc. 67, pp. 18, pls. 2, 1908). As before, the author has published, a few years ago, a very much more valuable monograph of the group. Dr. F. Hendel presents the sub-family Lauxaninæ of the dipterous family Muscidæ (fasc. 68, pp. 66, pls. 3, 1908). There is a general account of the biology, and the generic characters seem to be thoroughly elucidated. Albert Bovie is the author of three fascicles on parts of the great family Curculionidæ, or weevils. Fasc. 69—Entiminae, pp. 7, 1 pl.; fasc. 70, Cryptodermidæ, pp. 3, 1 pl.; fasc. 71, pp. 11, 1 pl.—Alcidinæ. All of the forms are tropical. A useful feature is the figuring of a number of types.

AN article of great interest to all entomologists is that by Mr. W. F. Kirby on the length of life of British entomologists.² Mr. Kirby has looked up the figures for 309 persons and finds that entomologists live much longer than many other classes. He suggests that the list should induce insurance companies to offer reduced rates to entomologists. The greatest number of deaths (15) occurred at the age of 72; the next (12) at 65; the next (10) at 74; 9 at 58, at 60, at 62, at 66, at 67 and at 70; 8 at 76 and at

82; 9 lived over 90 years. It is hardly possible that figures for American entomologists would produce as favorable results.

DR. E. BERGROTH is the author of a very useful catalogue of the species of the Hemipterous family, Pentatomidæ,³ that have been described since the catalogue of Lethierry and Severin, which was issued in 1893. These fifteen years have witnessed great activity in this family; no less than 1,000 species have been added, and 140 new genera proposed during this time. Africa has furnished a larger proportion of the new forms than any other continent; South America and Australia are well represented, but the Central American region is scarcely mentioned.

DR. O. M. REUTER has given a notice of changes in names and synonymy preliminary to a monograph of the Nabidæ.⁴ A number of species considered are from the United States. The *Reduviolus limbatus* of Europe he records from Canada and Colorado, and our little *Carthasis*, previously considered as the Mexican species, he describes as *C. contrarius*. He also describes a new species from California. It is with great regret that we learn that Dr. Reuter can not do further original work on insects.

AUSTRALIAN mosquitoes are treated by Thos. L. Bancroft in a recent number of the Annals of the Queensland Museum (No. 8, 64 pages, 1908). He has taken 32 species in Queensland, gives full descriptions of them, and often notes on the habits of the adults. Only four species are common enough to be a nuisance, and two of these were introduced, *Culex fatigans* and *Stegomyia fasciata*.

MR. R. DEMOLL has made an extensive attempt to homologize the various parts of the cibarian structure of bees.⁵ He gives a comparative account of the morphology of the

² "Enumeratio Pentatomidarum post Catalogum Bruxellensem descriptarum," *Mém. Soc. Entom. Belg.*, XV., pp. 130-200, 1908.

³ "Bemerkungen über Nabiden, nebst Beschreibung neuer Arten," *Mém. Soc. Entom. Belg.*, XV., pp. 87-130, 1908.

⁵ "Die Mundteile der solitären Apiden," *Zeitschr. wissensch. Zool.*, XCI., 1-51, 1908.

² "On the Longevity of British Entomologists," *Zoologist* (4), XII., 216-221, 1908.

mouth parts in all of the principal genera of bees. There are chapters on the function of the tongue, and on the adaptation of the mouth parts to the flowers visited by the bees. There are many text-figures, and two fine double plates.

THE British Museum (Nat. Hist.) has issued an illustrated guide to the insects exhibited in its halls; evidently prepared by Mr. Waterhouse.⁶ There is a general account of insects, and full treatment of the lower orders. The Coleoptera and Hemiptera are barely mentioned, as the series is not completed in these groups; and of the Diptera only the blood-sucking forms receive attention. A number of the illustrations are photographs of nests of wasps, ants and termites.

MR. M. T. SWENK has given a revision of our species of a part of the large genus of bees—*Colletes*.⁷ He treats of the species which have black hair on the thorax of the female; these are 26 in number. Besides the technical descriptions, which appear very complete, there is much matter on the distribution, flower-habits, etc., of the various species. The three plates illustrate the seventh ventral segment of the male. It is unfortunate that the reprint bears no indication of the journal of which it forms a part.

NATHAN BANKS

SPECIAL ARTICLES

ON A COMMUNICATION BETWEEN THE AIR-BLADDER AND THE EAR IN CERTAIN SPINY-RAYED FISHES

A CONNECTION between the air-bladder and the ear in spiny-rayed fishes has been touched upon from time to time since Weber described the elaborate connection between these organs in the Osteriophysi (cat-fishes, minnows, etc.) brought about by the chain of ossicles which bears his name. In the spiny-rayed fishes, however, this connection has usually been through the apposition of the air-bladder to a

cartilaginous wall where certain of the lateral cranial bones have failed to come together to complete the bony wall of the lower part of the pterotic capsule. The perilymph which bathes the inner surface of the cartilaginous wall and the auditory organs completes the communication. Such is the case in *Lotella*¹ and in *Myripristis*.

Recently I have found in *Nematistius pectoralis* a more highly specialized connection between the ear and the air-bladder than has been noticed before among the spiny-rayed fishes; the connection in this case being brought about through a long tunnel actually penetrating the basioccipital bone and being confined to that bone at its lower end.

In *Myripristis* (*M. occidentalis*) the lower part of the pterotic capsule is separated off as a special sacculus or otolith chamber in the outer wall of which is a large cartilaginous area between the prootic in front, the basioccipital below and the exoccipital above and behind. To this cartilage a large prolongation from the air-bladder is broadly attached.

In *Holocentrus* (*H. ascensionis*) this condition is somewhat modified. On the side of the cranium the otolith chamber forms an elongate and tube-like prominence, which is extended backwards to the side of the occipital condyle, where it opens widely through a symmetrical, round, smooth aperture. The side of the otolith chamber is mostly formed by the prootic prolonged backwards, though the exoccipital above and the basioccipital below assist materially.² The length of the chamber is nearly filled by a very large otolith. This posterior opening, though obviously of a more highly specialized character than in *Myripristis*, still occurs between the same bones. It apparently has no cartilaginous covering homologous with the cartilaginous lateral area in *Myripristis*, but the thin inner membrane of the air-bladder forms a sort of a loose

¹ Reported on by T. J. Parker, *Trans. N. Zeal. Inst.*, 1882, Vol. 15, p. 234.

² For a picture of the cranium of *Holocentrus ascensionis* showing the exterior of the otolith chamber see "The Osteology of Some Berycoid Fishes," Starks, *Proc. U. S. Nat. Mus.*, Vol. XXVII., p. 611.

⁶ "A Guide to the Exhibited Series of Insects," with 62 illustrations, 57 pages, London, 1908.

⁷ "Specific Characters in the Bee Genus, *Colletes*," pp. 43-102, 3 pls., 1908; University of Nebraska, Contrib. Dept. Entom., No. 1.